



Primary Standards Laboratory Metrology Program

Fact Sheet

Pressure

The Primary Standards Laboratory (PSL) maintains a wide variety of primary pressure standards to insure accurate and traceable measurements for its customers. All the primary pressure standards are directly traceable to the National Institute of Standards and Technology.

Primary pressure standards consist of air piston gages, oil piston gages, and quartz transducers.

The effective areas of piston gages at various pressures are obtained by using air and oil gage cross-float systems operating in the gage mode. A gas (usually nitrogen) is used as the pressure-transmitting medium in an air-piston gage cross-float calibration at pressures ranging from 1.4kPa to 6.9 MPa (0.2 to 1000 psig). Oil is used as the pressure medium in an oil piston gage cross-float calibration at pressures ranging from 1.4 to 275 MPa (200 psig to 40 kpsig).

A stand-alone air-piston gage system performs calibrations of gages and transducers in absolute or gage mode in pressures ranging from 1.4 kPa to 6.9 MPa. The oil cross-float system can also be operated in the gage mode to calibrate other gages and transducers for pressures from 1.4 to 275 MPa.

Capabilities

Pneumatic Deadweight Piston Gauges (absolute mode) - Direct Pressure Comparison

Range	Best Uncertainty (\pm) ppm, k=2	Remarks
0.002 - 0.175 MPa	31	N ₂ ; 0.2 – 25 psig
0.02 - 7 MPa	46	N ₂ ; 2 – 1k psig

Pneumatic Deadweight Piston Gauges (gage mode) - Direct Pressure Comparison

Range	Best Uncertainty (\pm) ppm, k=2	Remarks
0.002 - 0.175 MPa	29	N ₂ ; 0.2 – 25 psig
0.02 - 7 MPa	44	N ₂ ; 2 – 1 kpsig

Pneumatic Deadweight Piston Gauges - Cross Float Method

Range	Best Uncertainty (\pm) ppm, k=2	Remarks
0.002 - 0.175 MPa	35	N ₂ ; 0.2 – 25 psig
0.02 - 7 MPa	46	N ₂ ; 2 – 1 kpsig

Hydraulic Deadweight Piston Gauges - Direct Pressure Comparison

Range	Best Uncertainty (\pm) ppm, k=2	Remarks
0 - 28 MPa	44	N ₂ ; 0 – 4 kpsig
0 - 138 MPa	61	N ₂ ; 0 – 20 kpsig
0 - 275 MPa	59	N ₂ ; 0 – 40 kpsig



The pressure lab possesses an intrinsic pressure standard, an ultrasonic interferometer manometer designed and built by NIST, which will be used for high-accuracy, low-pressure measurements. The pressure lab has the capability and flexibility to accommodate specialized, one-of-a-kind calibrations.

Consultation is provided to customers on proper selection, maintenance, and use of standards and transducers.

Major Resources

- Ruska oil piston gage cross-float system
- Ruska air piston gage cross-float system
- Ruska air piston calibration system
- Intrinsic ultrasonic interferometer manometer

Selected Accomplishments

- Performed surveys and audits of commercial pressure calibration facilities and qualified them as DOE/NNSA-approved commercial calibration laboratories.
- Sponsored a precision pressure measurement workshop that brought together pressure measurement experts from DOE, NIST, U.S. Army, NASA, and industry.

Hydraulic Deadweight Piston Gauges – Cross Float Method

Range	Best Uncertainty (\pm) ppm, k=2	Remarks
0 - 28 MPa	46	N ₂ ; 0 – 4 kpsig
0 - 138 MPa	67	N ₂ ; 0 – 20 kpsig
0 - 275 MPa	61	N ₂ ; 0 – 40 kpsig



Oil Cross Float From 200 PSIG to 40 KPSIG

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